QUARTZ DRUM AND METHOD OF MAKING

Field of Inv ntion

The present invention generally relates to musical instruments, and, in particular, to musical drums and methods of making musical drums.

Background

Musical instruments comprising quartz and glass elements are known in the art, for example the instrument known as a "glass harmonica," which typically includes a plurality of glass or quartz cups of various sizes. Sound is produced by running a moistened finger around the rim of a cup, the frequency determined by the size and composition of the cup.

Musical drums are typically made of fiberglass or acrylic plastic. Glass-shell drums are also known that comprise multiple plates of glass mounted upon a brass superstructure.

Summary of the Invention

The present invention is directed to a method of making a quartz-shell drum. The method comprises the steps of heating a quartz tube to a temperature at least sufficient to enable quartz to flow. A diameter of a portion of the heated quartz tube is enlarged to a predetermined size. The enlarged tube is cut perpendicular to a longitudinal axis to create a shell having a desired height. A top bearing edge and a bottom bearing edge of the shell are ground to form smooth radii. (Hereinafter, the terms "top edge" and "bottom edge" are to be construed as "top bearing edge" and "bottom bearing edge," as they are known in the art.) The top and the bottom edges are fused to create top and bottom

rounded edges. In an alternate embodiment, the top edge is instead formed to be inwardly angled. Finally, a top and a bottom head are affixed to the top and the bottom edges, respectively, to form a drum.

The features that characterize the invention, both as to organization and method of operation, together with further objects and advantages thereof, will be better understood from the following description used in conjunction with the accompanying drawing. It is to be expressly understood that the drawing is for the purpose of illustration and description and is not intended as a definition of the limits of the invention. These and other objects attained, and advantages offered, by the present invention will become more fully apparent as the description that now follows is read in conjunction with the accompanying drawing.

Brief Description of the Drawings

FIG. 1 is a side perspective view of a quartz tube mounted on a lathe.

FIG. 2 is a side perspective view of the quartz tube having an enlarged central portion.

FIG. 3 is a side perspective view of the tube ready for cutting.

FIGS. 4A and 4B are side cross-sectional views of the shell with a rounded top edge and an inwardly angled top edge, respectively.

FIG. 5 is a side perspective view of a finished quartz shell drum.

D tail d Description of th Pref rr d Embodiment

A description of the preferred embodiments of the present invention will now be presented with reference to FIGS. 1-5.

The method of the present invention for making a quartz-shell drum **10** comprises the steps of heating a central portion **11** of a quartz tube **12** to a temperature at least sufficient to enable quartz to flow. The quartz tube **12** preferably comprises a generally cylindrical stock made from 99.9% pure crushed crystalline quartz powder. The heating step is preferably accomplished by affixing a headstock end **13** of the quartz tube **12** for rotation to a glass lathe **14**, leaving a tailstock end **15** opposed to the headstock end **13** decoupled from the lathe's rotational motion (FIG. 1). The heated quartz tube **12** is rotated using the lathe **14**, and a high-temperature hydrogen/oxygen torch **33** is used to heat the quartz tube's central portion **11** to approximately 2300°C.

The lathe **14** is used to apply centripetal acceleration, in order to permit a wall **16** of the quartz tube **12** to spread outward, thereby enlarging the quartz tube's diameter **17** along the central portion **11**. Since the torch is only applied to the central portion **11**, a diameter **18** at the headstock **13** and the tailstock **15** ends remains smaller than that of the central portion **11**. Molten quartz material moves toward the central portion **11** from the tailstock end **15**, maintaining a substantially equal wall thickness, a process that continues until a predetermined diameter is reached.

In order to ensure that the predetermined size is accomplished, a diameter-controlling means is affixed at a predetermined distance from the quartz tube's longitudinal

axis **19** (FIG. 2). The predetermined distance is selected to limit an enlargement of the quartz tube's central portion diameter **17** to the predetermined size.

In a preferred embodiment, the diameter-controlling means comprises a graphite roller **20** that is affixed for rotation to a support **21** and means for rotating the roller. The roller **20** is positioned so that its longitudinal axis **22** is substantially perpendicular to the quartz tube's longitudinal axis **19**, the roller **20** thereby positioned to control the central portion's diameter **17**.

The roller support **21** includes a cooling bath **23** that is positioned to encompass a lower portion **24** of the roller **20**, leaving approximately 0.5 in. of the roller **20** protruding above the bath **23**. The bath **23** is adapted to hold a cooling fluid **25**, such as water, flowing through the bath. The roller **20** is rotatable using a motor **26** affixed to the support **21**, and thus portions of the roller **20** are positioned to rotate through the bath **23**, thereby cooling the section of the quartz tube's central portion **11** adjacent the roller **20**.

The wall thickness **27** is observed and controlled by the length of time the process is permitted to continue, so that when the quartz tube's central portion **11** reaches a predetermined diameter **17** and wall thickness **27**, the lathe's rotation is stopped.

In a particular embodiment, this process is repeated iteratively, for example, three times, to achieve a desired diameter. Each subsequent time the roller **20** is lowered to enable an increase in diameter. Preferably also substantially the entire process is automated, with the motor **26**, torch **33**, and roller **20** on a track moving in concert.

The tube **12** is then reheated to remove any residual strain or stress in the material.

With the tube **12** still remaining on the lathe **14**, the quartz tube's central portion **11** is separated from the headstock end **15** by using the torch to heat a location **28** adjacent an end of the central portion **11** adjacent the headstock end **15** sufficiently to enable the central portion **11** to be pulled away, with the tailstock end **13** remaining affixed to the central portion **11** (FIG. 3).

Next the enlarged central portion **11** of the tube **12** is cut perpendicular to the tube's longitudinal axis **19** to create a shell **29** having a desired height **30**, each shell **29** having a top edge **31** and a bottom edge **32**. The cutting step comprises affixing the central portion **11** for rotation to a cutting machine having a diamond wheel thereon to dice the tube into rings. The rings **29** are trimmed carefully to ensure that no chipped or square cuts remain on the edges **31,32**.

Next the top **31** and bottom **32** edges of the shell **29** are ground to form smooth radii (FIG. 4A). In an alternate embodiment (FIG. 4B), the top edge **31'** has an inward angle, which is believed preferable. The grinding is accomplished with a belt grinder and then hand grinding. The shell **29** is then cleaned for approximately 30 min. in a cleaning solvent such as ammonium bifluoride to ensure purity. Next , the shell **29** is washed and dried.

Finally, the top **31** and the bottom **32** edges are fused to create top and bottom rounded edges. In the alternate embodiment the shell **29'** of FIG. 4B, the top edge **31'** is fused in the inwardly angled state. The fusing step in a preferred embodiment comprises heating the top **31** and the bottom **32** edges with a torch ("firepolishing") to seal and fuse the quartz. The shell **29** is then cleaned and annealed in an annealing oven.

To create a drum **10** (FIG. 5), a top **33** and a bottom **34** head are affixed to the top **31** and the bottom **32** edges, respectively, by methods known in the art.

In the foregoing description, certain terms have been used for brevity, clarity, and understanding, but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such words are used for description purposes herein and are intended to be broadly construed. Moreover, the embodiments of the method illustrated and described herein are by way of example, and the scope of the invention is not limited to the exact details.

Having now described the invention, and the advantageous new and useful results obtained thereby, the new and useful methods, constructions, and reasonable equivalents thereof obvious to those skilled in the art, are set forth in the appended claims.